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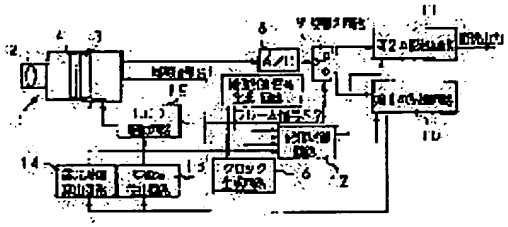
(54) IMAGE PICKUP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image pickup device in which an image with excellent contrast without smear or the like is obtained even when an upper part is picked up while preventing an image of an area including a road from getting dark and a road image or a lane image with excellent contrast at all times is obtained.

SOLUTION: This image pickup device has a camera 1 having a CCD 3 outputting an image signal and whose exposure time is controlled, an LCD 4 placed in front of the CCD 3 and driven partially, an image pickup control signal generating means 7 that outputs a synchronizing signal to start image pickup, an idle area detection means 13 that detects an idle area of an image pickup range for an odd number of times, an exposure time calculation means 14 that calculates an exposure time used for image pickup for an even number time depending on a luminance for other area than the idle area, and a filter drive means 15 that drives a block of the LCD 4 in an idle area to be detected before start of image pickup for even number times to attenuate a transmission luminous quantity, and image data obtained at image pickup for an even number time are outputted externally. Even when an idle area of an image is changed vertically at driving, the area of attenuating the luminous quantity is changed vertically by the LCD 4 depending on the change.



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* NOTICES *

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CLAIMS

[Claim(s)]

[Claim 1] The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to these image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of the above-mentioned image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, An image pck-up control signal generation means to generate the synchronizing signal which makes the image pck-up by the above-mentioned camera start, and to output to the above-mentioned camera for every fixed time, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included based on the above-mentioned picture signal obtained at the time of the odd image pck-up, Based on the picture signal obtained at the time of the odd above-mentioned image pck-up, the exposure time used at the time of the even image pck-up performed to the degree of the odd above-mentioned image pck-up is computed according to the brightness of the whole field other than the above-mentioned empty field detected by the above-mentioned empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to the above-mentioned camera, All the amount variant parts of transmitted lights in the field corresponding to the empty field by which the detection was carried out [above-mentioned] among two or more above-mentioned amount variant parts of transmitted lights Image pck-up equipment characterized by being constituted so that the above-mentioned picture signal which is equipped with a VCF drive means to drive before the even image pck-up start performed to the degree of the odd above-mentioned image pck-up, and is obtained, respectively at the time of the even image pck-up can be read from the exterior.

[Claim 2] The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to these image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of the above-mentioned image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, The frame signal which shows a clock generation means to output the clock signal used as criteria of operation, the synchronizing signal which makes the image pck-up by the above-mentioned camera start, the odd time, and the even image pck-up, respectively is generated from the above-mentioned clock signal. An image pck-up control signal generation means to output, and an A/D-conversion means to change the above-mentioned picture signal into image data, A sort means to classify the above-mentioned image data into the 1st image data obtained at the time of the odd image pck-up, and the 2nd image data obtained at the time of the even image pck-up based on the above-mentioned frame signal, So that the 1st and 2nd storage meanses to memorize the above 1st and the 2nd image data, respectively, and the storage means of the above 1st may memorize the 1st above-mentioned image data and the storage means of the above 2nd may memorize the 2nd above-mentioned image data, respectively A storage-control means to control both the above-mentioned storage means based on the above-mentioned synchronizing signal and a frame signal, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included from the 1st above-mentioned image data memorized by the storage means of the above 1st, From the 1st above-mentioned image data memorized by the storage means of the above 1st, the exposure time used at the time of the even image pck-up performed to the degree of the odd above-mentioned image pck-up is computed according to the brightness of the whole field other than the above-mentioned empty field detected by the above-mentioned empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to the above-mentioned camera, Based on the above-mentioned frame signal and the detection result of an empty field detection means, all the amount variant parts of transmitted lights in the field corresponding to the empty field by which the detection was carried out [above-mentioned] among two or more above-mentioned amount variant parts of transmitted lights Image pck-up equipment characterized by being constituted so that the 2nd above-

mentioned image data which is equipped with a VCF drive means to drive before the even image pck-up start performed to the degree of the odd above-mentioned image pck-up, and was memorized by the storage means of the above 2nd can be read from the exterior.
[Claim 3] The above-mentioned exposure-time calculation means is image pck-up equipment according to claim 1 or 2 characterized by being constituted so that the control signal with which the exposure time used at the time of the odd image pck-up performed in a time one after another is computed according to the mean brightness of the whole image pck-up domain at the time of the odd above-mentioned image pck-up, and this exposure time is expressed may be outputted to the above-mentioned camera.
[Claim 4] Two or more above-mentioned amount variant parts of transmitted lights are image pck-up equipment given in any 1 term of the claims 1-3 characterized by being arranged at least at vertical 1 train so that the whole abbreviation of the front face of the above-mentioned image sensors may be covered.
[Claim 5] The above-mentioned empty field detection means is a position corresponding to each center of longitudinal direction of two or more above-mentioned amount variant parts of transmitted lights. After detecting a brightness change lengthwise [in the odd image pck-up domain] and performing smoothing to this detected brightness change data Calculate the absolute value of the rate of change of the brightness change data which carried out [above-mentioned] smoothing, and a parvus predetermined value is made into a threshold from the maximum of the calculated above-mentioned absolute value. And the position which exceeds the above-mentioned threshold from the head of the above-mentioned brightness change data is searched. Image pck-up equipment given in any 1 term of the claims 1-4 characterized by being constituted so that it may judge that the position which exceeded the above-mentioned threshold first is the boundary of the empty field in the odd image pck-up domain, and fields other than an empty field and the field above this boundary may be detected as an empty field.
[Claim 6] The above-mentioned VCF means is image pck-up equipment given in any 1 term of the claims 1-5 characterized by consisting of liquid crystal equipment.
[Claim 7] The above-mentioned threshold is image pck-up equipment according to claim 5 characterized by being one half of the values of the above-mentioned maximum.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the image pck-up equipment for acquiring the image pck-up equipment carried in vehicles and other vehicles, such as an automobile, the picture image for detecting a front run way especially, the picture image for checking the field of view of vehicle back, etc.
[0002]
[Description of the Prior Art] Conventionally, as this kind of image pck-up equipment, there is technique indicated by JP,6-105194,A, for example. The up field of the empty which the bright light sources, such as solar light, enter in the video-signal field for screen formation where this conventional technique is outputted from CCD in the mounted cameras for vehicle back monitoring etc., Divide into two or more fields containing the lower field of the screen bottom which needs clearer authentication of the status on the street etc., and it is aimed only at the video-signal output from a lower field. Operate iris control and the iris control where CCD average output level is made to become fixed at a photographic subject's luminosity not related is prepared. To the video-signal output corresponding to the luminosity more than predetermined [of an up field], the light transmittance of an up field is reduced and it is characterized by preparing the ****** electro nick VCF constituted so that a luminosity might press down below to a predetermined value.
[0003] Specifically with the above-mentioned conventional technique, the erection potter's wheel ****** element (****** electro nick VCF) arranged so that the field of the front upper part of the lens which is ahead [CCD] may be covered, the VCF control circuit which controls this element, drawing arranged between a lens and CCD, and the iris control circuit which drives this drawing are prepared. And when the luminosity of an up field becomes beyond a predetermined value with this conventional technique, While the video signal of the up field outputted from CCD is outputted to a VCF control circuit and an erection potter's wheel ****** element is controlled to press down the luminosity of an up field below to a predetermined value It is constituted so that the video signal of the lower field outputted from CCD may be outputted to an iris control circuit and drawing may be controlled so that CCD average output level in a lower field may become fixed.
[0004]
[Problem(s) to be Solved by the Invention] However, there is following trouble (1) - (3) with the above-mentioned conventional technique. These troubles are explained based on the drawing 10 and the drawing 11 . In (A) of drawing 10 , (B) of this drawing the image pck-up status at the time of a level way run the image pck-up status in a downhill inlet or the outlet of an uphill The picture image from which (F) is obtained at the time of an image pck-up of (C) in the picture image from which (E) is obtained at the time of an image pck-up of (B) in the picture image from which (D) is obtained at the time of an image pck-up of (A) in the status at the time of an upper part image pck-up according [(C)] to vibration of a vehicle is shown, respectively. And (A) - (E) of drawing 11 shows during the run a mode that a picture image changes every moment.
(1) The erection potter's wheel ****** element for pressing down the luminosity of an up field acts only on the light passing through the field of the front upper part of a lens, and attenuates the quantity of light (quantity of light of field a shown in (D) - (F) of drawing 4). That is, the light in which an erection potter's wheel ****** element can decrease the quantity of light is restricted to the light passing through the field of the front upper part of a lens. Or the optical axis of a camera is more nearly up [than a horizontal direction] suitable with vibration of a vehicle. therefore, (B) of drawing 10 shows -- as -- under a run -- a vehicle -- a downhill inlet and the outlet of an uphill -- putting -- such a thing, as (C) of drawing 10 shows As (E) of drawing 10 , (F), and (B) of drawing 11 show, when the width of face of the vertical orientation of the empty field which contains the empty fraction in an image pck-up screen by this becomes large, it may stop covering the whole empty field with an erection potter's wheel ****** element. In such a case, as shown in drawing 11 (B), when the sun was picturized in the empty field which cannot be covered with an erection potter's wheel ****** element, the smear and the blooming occurred in the picture image and there was a

problem that the good picture image of contrast was not acquired.
[0005] (2) Since drawing is controlled so that CCD average output level in a lower field becomes fixed When being adjusted so that a lower field may serve as proper denudation by the picture image of (A) of drawing 11 , the empty field which cannot be covered with an erection potter's wheel ****** element for the ground mentioned above as (B) of drawing 11 showed -- it can do -- the inside of a lower field -- high -- if a brightness empty field is contained, CCD average output level in a lower field will become large, and drawing will be extracted Consequently, there was a problem that the picture image of the lower field containing a part for the road department will become dark. If the empty field which expands the size of an erection potter's wheel ****** element downward, and can be covered with this element is expanded downward in order to solve this problem, the light income of a lower field will decline in the expansion fraction of an erection potter's wheel ****** element at the time of a level way run, and the picture image of a lower field will become dark.
[0006] (3) Since the picture signal outputted to a VCF control circuit in order to control an erection potter's wheel ****** element, and the picture signal outputted to the exterior are the same, when the sun is picturized by vibration of a vehicle etc., the picture image (refer to (B) of drawing 11) with the smear which the quantity of light does not decrease by the erection potter's wheel ****** element, or a blooming will be outputted for a moment. In case this detects a passage and a lane by the image processing, the good passage picture image or lane picture image of contrast are not acquired, but it poses especially a problem. It is offering the image pck-up equipment with which this invention was made in view of such a situation, and the good picture image of the contrast which does not have a smear etc. even when the technical probrem's picturizes the upper part, preventing the picture image of the field containing a part for the road department becoming dark is acquired, and the good passage picture image and lane picture image of contrast are always acquired.
[0007]
[Means for Solving the Problem] The image pck-up equipment which relates to invention according to claim 1 in order to solve the above-mentioned technical probrem The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, An image pck-up control signal generation means to generate the synchronizing signal which makes the image pck-up by the camera start, and to output to the above-mentioned camera for every fixed time, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included based on the picture signal obtained at the time of the odd image pck-up, Based on the picture signal obtained at the time of the odd image pck-up, the exposure time used at the time of the even image pck-up performed to the degree of the odd image pck-up is computed according to the brightness of the whole field other than the empty field detected by the empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to a camera, All the amount variant parts of transmitted lights in the field corresponding to the empty field detected among two or more amount variant parts of transmitted lights It shall have a VCF drive means to drive before the even image pck-up start performed to the degree of the odd image pck-up, and it shall be constituted so that the picture signal obtained, respectively at the time of the even image pck-up can be read from the exterior.
[0008] Moreover, the image pck-up equipment which relates to invention according to claim 2 in order to solve the above-mentioned technical probrem The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, The frame signal which shows a clock generation means to output the clock signal used as criteria of operation, the synchronizing signal which makes the image pck-up by the camera start, the odd time, and the even image pck-up, respectively is generated from a clock signal. An image pck-up control signal generation means to output, and an A/D-conversion means to change a picture signal into image data, A sort means to classify image data into the 1st image data obtained at the time of the odd image pck-up, and the 2nd image data obtained at the time of the even image pck-up based on a frame signal, So that the 1st and 2nd storage meanses to memorize the 1st and 2nd image data, respectively, and the 1st storage means may memorize the 1st image data and the 2nd storage means may memorize the 2nd image data, respectively A storage-control means to control both the storage means based on a synchronizing signal and a frame signal, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included from the 1st image data memorized by the 1st storage means, From the 1st

image data memorized by the 1st storage means, the exposure time used at the time of the even image pck-up performed to the degree of the odd image pck-up is computed according to the brightness of the whole field other than the empty field detected by the empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to a camera, Based on a frame signal and the detection result of an empty field detection means, all the amount variant parts of transmitted lights in the field corresponding to the empty field detected among two or more amount variant parts of transmitted lights It shall have a VCF drive means to drive before the even image pck-up start performed to the degree of the odd image pck-up, and it shall be constituted so that the 2nd image data memorized by the 2nd storage means can be read from the exterior.

[0009] Preferably, an exposure-time calculation means computes the exposure time used at the time of the odd image pck-up performed in a time one after another according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up, and it is constituted so that the control signal showing this exposure time may be outputted to a camera. Preferably, two or more amount variant parts of transmitted lights are arranged at least at vertical 1 train so that the whole abbreviation of the front face of image sensors may be covered. It is a position corresponding to the center of each desirable longitudinal direction of the amount variant part of transmitted lights of a plurality [means / empty field detection]. After detecting a brightness change lengthwise [in the odd image pck-up domain] and performing smoothing to this detected brightness change data Calculate the absolute value of the rate of change of the smoothed brightness change data, and a parvus predetermined value is made into a threshold from the maximum of the calculated absolute value. And the position which exceeds a threshold from the head of brightness change data is searched, and it judges that the position which exceeded the threshold first is the boundary of the empty field in the odd image pck-up domain, and fields other than an empty field, and it is constituted so that the field above this boundary may be detected as an empty field. Preferably, the VCF means consists of liquid crystal equipment. Preferably, thresholds are one half of values of maximum.

[0010]

[Function] With image pck-up equipment according to claim 1, a camera starts an image pck-up of each time by the input of a synchronizing signal. At the time of the odd image pck-up (2n - the 1st time), while the empty field in an image pck-up domain is detected by the empty field detection means, it is computed by the exposure-time calculation means according to the brightness of the whole field other than the empty field where the exposure time used at the time of the even image pck-up (2ntime) was detected. All the amount variant parts of transmitted lights that are in the field corresponding to the empty field detected at the time of the odd image pck-up among two or more amount variant parts of transmitted lights of a VCF means before the even image pck-up (2ntime) are driving by the VCF drive means so that the quantity of light of an empty field may be attenuated. Therefore, at the time of the even image pck-up (2ntime), an image pck-up is made by the exposure time which is in the status decreased by the amount variant part of transmitted lights which has the quantity of light of an empty field in the field corresponding to an empty field, and was computed by the exposure-time calculation means. And the external ** output of the picture signal obtained, respectively at the time of the even image pck-up can be carried out.

[0011] Moreover, with image pck-up equipment according to claim 2, a camera starts an image pck-up of each time by the input of a synchronizing signal. After changing into image data the picture signal obtained at the time of an image pck-up of each time by the A/D-conversion means, it is classified into the 1st image data obtained based on a frame signal at the time of the odd image pck-up, and the 2nd image data obtained at the time of the even image pck-up according to a sort means. By the control by the storage-control means, the 1st image data is memorized by the 1st storage means, and the 2nd image data is memorized by the 2nd storage means, respectively. At the time of the odd image pck-up (2n - the 1st time), from the 1st memorized image data, while the empty field in an image pck-up domain is detected by the empty field detection means, it is computed by the exposure-time calculation means according to the brightness of the whole field other than the empty field where the exposure time used at the time of the even image pck-up (2ntime) was detected. Before the even image pck-up (2ntime), all the amount variant parts of transmitted lights in the field corresponding to the empty field detected at the time of the odd image pck-up among two or more amount variant parts of transmitted lights of a VCF means have already driven by the VCF drive means. Therefore, at the time of the even image pck-up (2ntime), an image pck-up is made by the exposure time which is in the status decreased by the amount variant part of transmitted lights which has the quantity of light of an empty field in the field corresponding to an empty field, and was computed by the exposure-time calculation means. And the 2nd image data memorized by the 2nd storage means can be outputted to the exterior.

[0012] Thus, since it is made where the quantity of light of the empty field detected with image pck-up equipment according to claim 1 at the time of the odd image pck-up to which the even image pck-up is performed before the image pck-up is decreased by the VCF means Even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the

quantity of light by the VCF means according to the change can be changed in the vertical orientation. Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. And since the picture signal used for controlling a VCF means differs from the picture signal to output, when the sun is picturized by vibration of a vehicle etc., the picture image with a smear [that the quantity of light is allowed to decline by the VCF means] or a blooming is not outputted for a moment, either.

[0013] Moreover, since the 1st image data used for detecting an empty field at the time of the odd image pck-up, and computing the exposure time with image pck-up equipment according to claim 2 and the 2nd image data used for outputting to the equipment exterior at the time of the even image pck-up are memorized for another storage means, it can prevent more that the picture image with a smear or a blooming is outputted to an authenticity. Moreover, the each odd image pck-up is made by the exposure time according to the dawn lightness of an image pck-up domain which changes every moment by computing the exposure time used one after another at the time of an image pck-up of a time according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up. Moreover, the quantity of light of the arbitrary fields of image sensors can be decreased by the amount variant part of transmitted lights by arranging in vertical 1 train at least so that two or more amount variant parts of transmitted lights may be covered for the whole abbreviation of the front face of image sensors. Moreover, in case the boundary of an empty field is detected, by performing smoothing to the detected brightness change data, a very small brightness change included in brightness change data can be removed, and the boundary detection with little influence by the noise can be performed. Moreover, a VCF means is realizable by the device of marketing of liquid crystal equipment, then a VCF means. Moreover, the time at the time of searching the position which exceeds a threshold from the head of brightness change data can be shortened by having set the threshold to one half of maximums.

[0014]

[Embodiments of the Invention] Hereafter, the gestalt of implementation of this invention is explained based on a drawing. Drawing 1 shows the image pck-up equipment concerning the 1 operation gestalt of this invention. This image pck-up equipment is carried in vehicles, such as an automobile, and it is used for acquiring the passage picture image and lane picture image for detecting a front run way for example. The image pck-up equipment shown in drawing 1 is equipped with CCD camera (only henceforth a camera) 1. This camera 1 is equipped with LCD (liquid crystal equipment)4 arranged at the front-face (light-receiving side) side of CCD3 and CCD3 which outputs the picture signal according to the optical intensity of the light which carries out incidence through a lens 2 and the lens 2, and is constituted possible [a control of the exposure time of the incident light to CCD3].

[0015] The camera 1 is installed in the predetermined part of an automobile 5, for example, the up inside of windshield 5a, so that a lens 2 side turns to the front, and a camera optical axis (optical axis of a lens 2) may receive horizontally and may make a predetermined angle (refer to the drawing 6). CCD3 is 2-dimensional CCD which has the pixel of the masses arranged in 2 dimensions, reads the output which changed the optical intensity of an incident light into the electrical signal by the photoelectrical transducer of each pixel one by one, and outputs it as a picture signal.

[0016] LCD4 has two or more blocks (the amount variant part of transmitted lights) which have been arranged at the front-face side of CCD3 and in which a split drive is possible. That is, LCD4 is divided into nxm piece block 4a as shown in drawing 2 , and each block 4a consists of a polarizing plate of a liquid crystal cell and a couple etc. Since each block 4a is independently driven by controlling the voltage given to each block 4a and the permeability changes, only the quantity of light of the light which penetrates the field of each driven block 4a, and carries out incidence to CCD3 can be attenuated. Therefore, the quantity of light of the arbitrary fields of image pck-up within the limits picturized with a camera 1 can be attenuated by driving block 4a in the arbitrary fields of two or more block 4a.

[0017] The image pck-up equipment shown in drawing 1 is equipped with the clock generation circuit 6 which outputs the clock signal used as the criteria of operation other than a camera 1, the image pck-up control signal generation circuit 7, A/D converter 8, the change circuit 9, the 1st store circuit 10, the 2nd store circuit 11, the storage-control circuit 12, the empty field detector 13, the exposure-time calculation circuit 14, and LCD drive circuit 15. The image pck-up control signal generation circuit 7 generates and outputs the synchronizing signal S1 which makes the image pck-up by the camera 1 start, and the frame signal S2 which shows the odd image pck-up and the even image pck-up, respectively from the clock signal outputted from the clock generation circuit 6. A synchronizing signal S1 is a pulse signal outputted for every fixed time. On the other hand, the frame signal S2 is set to "0" at the time of the odd image pck-up, and is set to "1" at the time of the even image pck-up.

[0018] A/D converter 8 changes into the image data of a digital signal the picture signal outputted from CCD3. The change circuit 9 is the odd time (2n - the 1st time.) about the image data outputted from A/D converter 8 based on the frame signal S2 outputted from the image pck-up control signal generation circuit 7. Here, n is distributed to the image data at the time of an image pck-up of one or more integers (the 1st image data), and the image data (the 2nd image data) at the time of the even image pck-up (2ntime). The storage-control circuit 12 is constituted so that both the store circuits 10 and 11 may be controlled by the storage-control signal generated from the signal showing a clock signal, the synchronizing signal S1, the frame signal S2, and the exposure time mentioned later so that the image data at the time of the image pck-up whose 2nd store circuit 11 is the even time about the image data at the time of the image pck-up whose 1st store circuit 10 is the odd time may be memorized to timely, respectively.
[0019] The empty field detector 13 detects the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain (image pck-up screen) is included, and it consists of the 1st image data memorized by the 1st store circuit 10 so that the signal showing this detected empty field may be outputted. The exposure-time calculation means 14 from the 1st image data memorized by the 1st storage means 10 The exposure time (T2n) used according to the mean brightness of the whole field other than the empty field detected by the empty field detection means 13 in the odd image pck-up domain (2n - the 1st time) at the time of next time (2ntime), i.e., the even image pck-up, is computed. It is constituted so that the signal showing this exposure time may be outputted to a camera 1 at the time of the even image pck-up. Moreover, the exposure-time calculation means 14 computes a time (T2n+1), i.e., the exposure time at the time of the odd image pck-up (2n+1 time), one after another according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up (2n - the 1st time), and it is constituted so that the signal showing this exposure time may be outputted to a camera 1 one after another at the time of an image pck-up of a time. Furthermore, the exposure-time calculation means 14 outputs the signal with which the exposure time of the midrange value which can be set up as exposure time is expressed at the time of the 1st image pck-up after activation of image pck-up equipment to a camera 1. In addition, it may memorize in the memory whose computed exposure time (2n, 2n+1) is not illustrated, and you may constitute so that each of this memorized exposure time may be used at the time of a corresponding image pck-up.
[0020] LCD drive means 15 drives all block 4a in the field corresponding to the empty field detected by the empty field detection means 13 among two or more block 4a of LCD4 at the time of the odd photography (2n - the 1st time) so that permeability may be fallen before the even image pck-up start (2ntime). Since it drives independently by LCD drive means 15 and the permeability falls, each block 4a can attenuate only the quantity of light of the light which penetrates each block 4a and carries out incidence to CCD3.
[0021] If a synchronizing signal S1 is outputted from the image pck-up control signal generation means 7, the camera 1 is constituted so that exposure may be started. That is, a camera 1 will reset the charge accumulated at the charge store section of each pixel of CCD3, if a synchronizing signal S1 is inputted. The charge store section of each pixel of CCD3 begins to accumulate the charge according to the optical intensity of an incident light, exposure is started by this, and an image pck-up of each time is started. Moreover, when the amount (average) of charges accumulated among the charge store section of each pixel of CCD3 at the time of an image pck-up of each time turns into the amount of charges corresponding to the exposure time which the signal outputted from the exposure-time calculation means 14 expresses, the camera 1 is constituted so that read-out of an output may be started from the charge read-out section of each pixel of CCD3. Thus, a camera 1 is controlled by the signal with which the synchronizing signal S1 and the exposure time are expressed for the exposure time after resetting the charge accumulated among the charge store section of each pixel of CCD3 at the time of an image pck-up of each time until it starts read-out of the output of each pixel of CCD3. In addition, it is asked for the relation with the amount of charges corresponding to the exposure time and the exposure time by experiment. Furthermore, the image pck-up equipment shown in drawing 1 is constituted so that the 2nd image data memorized by 2nd storage means 11 (2ntime), i.e., the even image data, may be considered as an equipment output and it can read from the exterior.
[0022] Next, the operation of image pck-up equipment which has the above-mentioned configuration is explained based on drawing 3 . Drawing 3 shows flowing of an operation of image pck-up equipment together with the synchronizing signal S1 and the frame signal S2. In this drawing, the quadrature axis shows the passage of time.
[0023] (1) Explain the operation common to an image pck-up of each time first. A camera 1 resets the charge accumulated by the input of a synchronizing signal S1 at the charge store section of each pixel of CCD3. Exposure is started by this and an image pck-up of each time is started. After image pck-up start, a camera 1 reads an output (picture signal) from the charge read-out section of each pixel of CCD3, when the amount of charges accumulated at the charge store section of each pixel of CCD3 turns into the amount of charges corresponding to the exposure time which the output signal of the exposure-time calculation means 14 expresses. Exposure is completed by this. After the picture signal outputted from CCD3 is changed into

image data by A/D converter 8, it is classified into the 1st image data obtained based on the frame signal S2 at the time of the odd image pck-up (2n - the 1st time), and the 2nd image data obtained at the time of the even image pck-up (2ntime) according to the sort means 9. And by the control by the storage-control means, the 1st image data is memorized by the 1st storage means 10, and the 2nd image data is memorized by the 2nd storage means 11, respectively.

[0024] (2) Next, explain the odd image pck-up (2n - the 1st time). Now, the image pck-up to the even time (2n - the 2nd time) shall be completed. At this time, all block 4a of LCD4 is in the transparency status (whole LCD surface transparency). If a synchronizing signal S1 is inputted into a camera 1 at t 1:00 of drawing 3 , exposure will be started and an image pck-up will be started. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time which the output signal of the exposure-time calculation means 14 expresses, an output (picture signal) is read from each pixel of CCD3, and exposure is completed. The picture signal obtained at this time is changed into image data, and is memorized by the 1st storage means 10.

[0025] Next, the empty field in an image pck-up domain is detected by the empty field detection means 13 from the 1st image data memorized by the 1st storage means 10. According to the brightness of the whole field other than the empty field where the exposure time (T2n) used at the time of the even image pck-up (2ntime) was detected, it is computed by the exposure-time calculation means 14 after this detection. At this time, the exposure time (T2n+1) used at the time of the odd image pck-up (2n+1 time) performed in a time one after another is also computed by the exposure-time calculation means 14 according to the mean brightness of the whole image pck-up domain containing fields other than the detected empty field and an empty field. All block 4a in the field corresponding to the empty field detected among two or more block 4a of LCD4 before the even image pck-up start (2ntime) performed to a degree being simultaneous or at least with this calculation is driven by LCD drive means 15 so that the quantity of light may be decreased with each block.

[0026] (3) Next, explain the even image pck-up (2ntime). If a synchronizing signal S1 is inputted into a camera 1 at t 2:00 of drawing 3 , exposure will be started and an image pck-up will be started. At the time of this image pck-up, since all block 4a in the field corresponding to the empty field detected among two or more block 4a of LCD4 at the time of the odd image pck-up (2n - the 1st time) has already driven by LCD drive means 15, an image pck-up is made in the status that it decreased by all block 4a that has the quantity of light of an empty field in the field corresponding to this field. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time (T2n) computed with the exposure-time calculation means 14, an output is read from each pixel of CCD3, and exposure is completed. The picture signal obtained at this time is changed into image data, and is memorized by the 2nd storage means 10. This 2nd memorized image data is read to the exterior. After storage of the 2nd image data, a drive of LCD4 by LCD drive means 15 is canceled, and all block 4a of LCD4 is changed into the transparency status (whole LCD surface transparency).

[0027] (4) Next, explain the odd image pck-up (2n+1 time). If a synchronizing signal S1 is inputted into a camera 1 at t 3:00 of drawing 3 , exposure will be started and an image pck-up will be started. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time (T2n+1) computed with the exposure-time calculation means 14, an output is read from each pixel of CCD3, and exposure is completed. Since it is the same as that of the time of the odd image pck-up (2n - the 1st time) mentioned above, a next operation is omitted.

[0028] Thus, the odd image pck-up and the even image pck-up are repeated by turns at the time of a run. In addition, at the time of activation of image pck-up equipment, all block 4a of LCD4 is in the transparency status (complete transparency). Moreover, at the time of the 1st image pck-up, the exposure-time calculation means 14 outputs the signal showing the midrange value which can be set up as exposure time.

[0029] Next, detection processing of the empty field which the empty field detection means 13 performs is explained based on the drawing 4 and the drawing 5 . A detection of an empty field is performed using the 1st image data memorized by the 1st storage means 10 by processing the brightness value of the orientation of Y in the position corresponding to the center of the orientation of X of each block 4a of LCD4. As an explanation here of operation, LCD4 explains the case of processing about the picture image acquired when it shall be trichotomized by longitudinal direction (n= 3), and 8 splits (m= 8) shall be carried out to lengthwise and a vehicle puts in the entrance of a slope, in order to simplify an explanation.

[0030] X1, X2, and X3 of (A) show the center of the orientation of X of each block 4a in the left column of the three columns of LCD4 trichotomized by longitudinal direction, the center of the orientation of X of each block 4a in a central column, and the center of the orientation of X of each block 4a in a right-hand side column, respectively. [of drawing 4] The Y coordinate of the picture image shown in (A) of drawing 4 shall be expressed with Y= 0 - Ymax.

[0031] First, brightness change of the orientation of Y in the position of X1 of the picture image shown in (A) of drawing 4 is detected. This brightness change is shown by (A) of drawing 5 . The variation is the

parvus, although an empty field has a large brightness value and there is a minute change, as shown in this drawing. In the fraction which shifts to fields other than the empty field which contains a mountain range, a building, a passage, etc. from an empty field, a brightness value becomes small abruptly, and a brightness value change is large.

[0032] Next, smoothing is performed to the brightness change data shown by (A) of drawing 5 , and a minute change is removed. Moving-average processing shown by the following formula 1 in order to perform this smoothing is used.

D(i+c/2) =(Di+Di+1+--+Di+c)/(c+1) (formula 1)

However, Di The number of the brightness value of Y=i, i= 0 - Ymax-c, and c is even. Although the value of c changes with field angles, it is usually made into several percent of Ymax. The smoothed brightness change data are shown by (B) of drawing 5 .

[0033] Next, the absolute value of the rate of change of the brightness change data smoothed by moving-average processing is calculated by the following formula 2. This result of an operation is shown by (C) of drawing 5 .

Di =|Di+1-Di | (formula 2) However, they are i=c/2 - Ymax+1-c. The wave shown by (C) of drawing 5 shows a big value in the fraction with a rapid brightness change. Next, the maximum of the absolute value calculated by the formula 2 is calculated, one half of these maximums is made into a threshold, the position which exceeds the threshold from the head of the wave shown by (C) of drawing 5 is searched, and it judges that the position (Y coordinate) which exceeded the threshold first is the boundary of the empty field in the odd image pck-up domain, and fields other than an empty field.

[0034] Next, based on the position (Y coordinate) of the boundary for which it asked, lengthwise number k of block 4a of LCD4 driven by LCD drive means 15 is computed by the following formula (3). Since the field above the position of the boundary for which it asked is an empty field at this time, number k lengthwise [above-mentioned] is computed so that the quantity of light of the whole field corresponding to this empty field may be attenuated by LCD4 and the decrement field of the quantity of light by LCD4 may wrap in an empty field.

Integer part +1 of 1 <=k<=(Ys xm)/(Ymax+1) (formula 3)

However, Ys is the Y coordinate of the boundary of fields other than an empty field and an empty field, and m is the lengthwise number of partitions (here m= 8) of LCD4.

[0035] Such detection processing is performed about each position of X1, X2, and X3 of the picture image shown in (A) of drawing 4 . Consequently, the value of the right-hand side of a formula 3 becomes 4 in the position of 4 and X2 in the position of X1 in the position of 5 and X3. In the above-mentioned example of processing as a result of performing such detection processing, the position data of 4 are outputted to LCD drive means 15 from the empty field detection means 13 in the position of 4 and X2 in the position of X1 in the position of 5 and X3. As this shows to (B) of drawing 4 , the quantity of light of the whole field corresponding to an empty field declines by LCD4.

[0036] by the way, angle theta [as opposed to / when a vehicle passes the salient object of a passage etc., the car body vibrates greatly, and / the horizontal direction of the optical axis of a camera 1] -- initial angle theta 0 **** -- it fluctuates (refer to [the drawing 6 and] the drawing 7) In the meantime, the odd picturized picture image changes, as (A) - (E) of drawing 8 shows. For the picture image of (A) of this drawing, angle theta is the initial angle theta 0. Abbreviation etc. is carried out and is. the thing at the time, and the picture image of (B) Angle theta is the initial angle theta 0. The thing when becoming large, and the picture image of (C) Angle theta is the initial angle theta 0 again. For the thing at the time of ********s, such as abbreviation, and the picture image of (D), angle theta is the initial angle theta 0. For the thing when becoming small, and the picture image of (E), angle theta is the initial angle theta 0 again. The thing when becoming which spreads abbreviation etc. is shown, respectively.

[0037] In drawing 9 , 9A-9E correspond to the image pck-up screen which shows the start stage of the odd image pck-up, respectively, and is shown by (A) - (E) of drawing 8 , respectively. Moreover, 10A-10E show the start stage of the even image pck-up, respectively. 11A-11E are the picture images of image pck-up within the limits obtained at the time of the even image pck-up, and show a mode that the quantity of light of the field corresponding to an empty field is declining by LCD4 (filtered), respectively.

[0038] the odd time and the even image pck-up operation mentioned above when the picture image picturized by vibration of a vehicle etc. at the time of a vehicle run changed, as (A) - (E) of drawing 8 shows -- winding -- ****** -- the quantity of light of the field corresponding to the empty field is attenuated by LCD4, following the empty field which changes in the vertical orientation every moment by things, as shown in drawing 9 Even if the empty field of the picture image picturized at the time of a vehicle run changes with this in the vertical orientation, the field which attenuates the quantity of light by LCD4 according to the change can be changed.

[0039] As explained above, according to the image pck-up equipment concerning the above-mentioned operation gestalt, following effect (1) - (3) is obtained.

(1) Since it is made where the quantity of light of the empty field detected at the time of the odd image pck-up the even image pck-up is performed [an image pck-up] to the last time of the image pck-up is decreased by LCD4, even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the quantity of light by LCD4 according to the change can be changed. Therefore, even when the upper part is picturized by vibration of a vehicle etc., the good picture image of the contrast without a smear or a blooming is acquired.
(2) Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. Therefore, it can prevent that the field containing a part for fields other than an empty field, i.e., the road department, becomes dark.
(3) The picture signal further used for controlling LCD4 differs from the picture signal outputted to the exterior. Therefore, when the sun is picturized by vibration of a vehicle etc., the picture image with the smear which the quantity of light does not decrease by LCD4, or a blooming is not outputted for a moment, either. Therefore, the good passage picture image and lane picture image of contrast can always be acquired.
[0040] Thus, it is especially effective, when detecting a run way which is shown also in drawing 9 by the image processing indicated by JP,3-314775,A etc. using this image data using the edge information on the white line of a road surface, since the good passage picture image and lane picture image of contrast can always be acquired. In addition, as a modification of the image pck-up equipment concerning the above-mentioned operation gestalt, it may replace with LCD4 and other elements which have two or more blocks which can decrease the quantity of light and in which a split drive is possible, for example, an erection potter's wheel ****** element etc., may be used.
[0041] Moreover, although LCD4 should be trichotomized by longitudinal direction and 8 ****s should be made lengthwise in the above-mentioned explanation, what is necessary is just LCD currently divided into the plurality in vertical 1 train at least. Moreover, with the above-mentioned operation gestalt, by detection processing of an empty field, the maximum of the absolute value calculated by the formula 2 is calculated, and one half of these maximums is made into the threshold. Although this threshold should be just smaller than maximum, the time at the time of searching the position which exceeds a threshold from the head of brightness change data can be shortened by having set the threshold to one half of maximums. Moreover, as a modification of the image pck-up equipment concerning the above-mentioned 1 operation gestalt, it can replace with CCD3 and other image sensors can be used. Moreover, you may establish the shutter means for controlling the exposure time to a camera 1 as a modification of the image pck-up equipment concerning the above-mentioned 1 operation gestalt. A shutter means can change an incident light to CCD3 between the open status whose incidence is made possible, and the closed status made into the incidence impotentia, and a mechanical shutter, the optical element which can be changed between the **** status and the shading status can be used for it. Moreover, the image pck-up equipment concerning this invention can be used effective also not only in vehicles, such as an automobile, but vessels, such as a large motorboat of other vehicles, for example, swinging under run.
[0042]
[Effect of the Invention] Since it is made according to the image pck-up equipment concerning invention according to claim 1 where the quantity of light of the empty field detected at the time of the odd image pck-up to which the even image pck-up is performed before the image pck-up is decreased by the VCF means as explained above Even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the quantity of light by the VCF means according to the change can be changed in the vertical orientation. Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. And since the picture signal used for controlling a VCF means differs from the picture signal to output, when the sun is picturized by vibration of a vehicle etc., the picture image with a smear [that the quantity of light is allowed to decline by the VCF means] or a blooming is not outputted for a moment, either. Therefore, even when the upper part is picturized, preventing that the picture image of the field containing a part for the road department becomes dark, the good picture image of the contrast without a smear etc. can obtain, and the good passage picture image and lane picture image of contrast can always be acquired. Since the 1st image data used for detecting an empty field at the time of the odd image pck-up, and computing the exposure time especially with the image pck-up equipment concerning invention according to claim 2 and the 2nd image data used for outputting to the equipment exterior at the time of the even image pck-up are memorized for another storage means, it can prevent more that the picture image with a smear or a blooming is outputted to an authenticity. Moreover, the each odd

image pck-up can be performed by the exposure time according to the dawn lightness of an image pck-up domain which changes every moment by computing the exposure time used one after another at the time of an image pck-up of a time according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up. Moreover, the quantity of light of the arbitrary fields of image sensors can be decreased by the amount variant part of transmitted lights by arranging in vertical 1 train at least so that two or more amount variant parts of transmitted lights may be covered for the whole abbreviation of the front face of image sensors. Moreover, in case the boundary of an empty field is detected, by performing smoothing to the detected brightness change data, a very small brightness change included in brightness change data can be removed, and the boundary detection with little influence by the noise can be performed. Moreover, a VCF means is realizable by the commercial device by considering a VCF means as liquid crystal equipment. Moreover, the time at the time of searching the position which exceeds a threshold for a threshold from 1/2 of maximum, then the head of brightness change data can be shortened.

[Translation done.]

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Field

[The technical field to which invention belongs] This invention relates to the image pck-up equipment for acquiring the image pck-up equipment carried in vehicles and other vehicles, such as an automobile, the picture image for detecting a front run way especially, the picture image for checking the field of view of vehicle back, etc.

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Technique

[Description of the Prior Art] Conventionally, as this kind of image pck-up equipment, there is technique indicated by JP,6-105194,A, for example. The up field of the empty which the bright light sources, such as solar light, enter in the video-signal field for screen formation where this conventional technique is outputted from CCD in the mounted cameras for vehicle back monitoring etc., Divide into two or more fields containing the lower field of the screen bottom which needs clearer authentication of the status on the street etc., and it is aimed only at the video-signal output from a lower field. Operate iris control and the iris control where CCD average output level is made to become fixed at a photographic subject's luminosity not related is prepared. To the video-signal output corresponding to the luminosity more than predetermined [of an up field], the light transmittance of an up field is reduced and it is characterized by preparing the ****** electro nick VCF constituted so that a luminosity might press down below to a predetermined value.
[0003] Specifically with the above-mentioned conventional technique, the erection potter's wheel ****** element (****** electro nick VCF) arranged so that the field of the front upper part of the lens which is ahead [CCD] may be covered, the VCF control circuit which controls this element, drawing arranged between a lens and CCD, and the iris control circuit which drives this drawing are prepared. And when the luminosity of an up field becomes beyond a predetermined value with this conventional technique, While the video signal of the up field outputted from CCD is outputted to a VCF control circuit and an erection potter's wheel ****** element is controlled to press down the luminosity of an up field below to a predetermined value It is constituted so that the video signal of the lower field outputted from CCD may be outputted to an iris control circuit and drawing may be controlled so that CCD average output level in a lower field may become fixed.

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Effect

[Effect of the Invention] Since it is made according to the image pck-up equipment concerning invention according to claim 1 where the quantity of light of the empty field detected at the time of the odd image pck-up to which the even image pck-up is performed before the image pck-up is decreased by the VCF means as explained above Even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the quantity of light by the VCF means according to the change can be changed in the vertical orientation. Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. And since the picture signal used for controlling a VCF means differs from the picture signal to output, when the sun is picturized by vibration of a vehicle etc., the picture image with a smear [that the quantity of light is allowed to decline by the VCF means] or a blooming is not outputted for a moment, either. Therefore, even when the upper part is picturized, preventing that the picture image of the field containing a part for the road department becomes dark, the good picture image of the contrast without a smear etc. can obtain, and the good passage picture image and lane picture image of contrast can always be acquired. Since the 1st image data used for detecting an empty field at the time of the odd image pck-up, and computing the exposure time especially with the image pck-up equipment concerning invention according to claim 2 and the 2nd image data used for outputting to the equipment exterior at the time of the even image pck-up are memorized for another storage means, it can prevent more that the picture image with a smear or a blooming is outputted to an authenticity. Moreover, the each odd image pck-up can be performed by the exposure time according to the dawn lightness of an image pck-up domain which changes every moment by computing the exposure time used one after another at the time of an image pck-up of a time according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up. Moreover, the quantity of light of the arbitrary fields of image sensors can be decreased by the amount variant part of transmitted lights by arranging in vertical 1 train at least so that two or more amount variant parts of transmitted lights may be covered for the whole abbreviation of the front face of image sensors. Moreover, in case the boundary of an empty field is detected, by performing smoothing to the detected brightness change data, a very small brightness change included in brightness change data can be removed, and the boundary detection with little influence by the noise can be performed. Moreover, a VCF means is realizable by the commercial device by considering a VCF means as liquid crystal equipment. Moreover, the time at the time of searching the position which exceeds a threshold for a threshold from 1/2 of maximum, then the head of brightness change data can be shortened.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, there is following trouble (1) - (3) with the above-mentioned conventional technique. These troubles are explained based on the drawing 10 and the drawing 11 . In (A) of drawing 10 , (B) of this drawing the image pck-up status at the time of a level way run the image pck-up status in a downhill inlet or the outlet of an uphill The picture image from which (F) is obtained at the time of an image pck-up of (C) in the picture image from which (E) is obtained at the time of an image pck-up of (B) in the picture image from which (D) is obtained at the time of an image pck-up of (A) in the status at the time of an upper part image pck-up according [(C)] to vibration of a vehicle is shown, respectively. And (A) - (E) of drawing 11 shows during the run a mode that a picture image changes every moment.
(1) The erection potter's wheel ****** element for pressing down the luminosity of an up field acts only on the light passing through the field of the front upper part of a lens, and attenuates the quantity of light (quantity of light of field a shown in (D) - (F) of drawing 4). That is, the light in which an erection potter's wheel ****** element can decrease the quantity of light is restricted to the light passing through the field of the front upper part of a lens. Or the optical axis of a camera is more nearly up [than a horizontal direction] suitable with vibration of a vehicle. therefore, (B) of drawing 10 shows -- as -- under a run -- a vehicle -- a downhill inlet and the outlet of an uphill -- putting -- such a thing, as (C) of drawing 10 shows As (E) of drawing 10 , (F), and (B) of drawing 11 show, when the width of face of the vertical orientation of the empty field which contains the empty fraction in an image pck-up screen by this becomes large, it may stop covering the whole empty field with an erection potter's wheel ****** element. In such a case, as shown in drawing 11 (B), when the sun was picturized in the empty field which cannot be covered with an erection potter's wheel ****** element, the smear and the blooming occurred in the picture image and there was a problem that the good picture image of contrast was not acquired.
[0005] (2) Since drawing is controlled so that CCD average output level in a lower field becomes fixed When being adjusted so that a lower field may serve as proper denudation by the picture image of (A) of drawing 11 , the empty field which cannot be covered with an erection potter's wheel ****** element for the ground mentioned above as (B) of drawing 11 showed -- it can do -- the inside of a lower field -- high -- if a brightness empty field is contained, CCD average output level in a lower field will become large, and drawing will be extracted Consequently, there was a problem that the picture image of the lower field containing a part for the road department will become dark. If the empty field which expands the size of an erection potter's wheel ****** element downward, and can be covered with this element is expanded downward in order to solve this problem, the light income of a lower field will decline in the expansion fraction of an erection potter's wheel ****** element at the time of a level way run, and the picture image of a lower field will become dark.
[0006] (3) Since the picture signal outputted to a VCF control circuit in order to control an erection potter's wheel ****** element, and the picture signal outputted to the exterior are the same, when the sun is picturized by vibration of a vehicle etc., the picture image (refer to (B) of drawing 11) with the smear which the quantity of light does not decrease by the erection potter's wheel ****** element, or a blooming will be outputted for a moment. In case this detects a passage and a lane by the image processing, the good passage picture image or lane picture image of contrast are not acquired, but it poses especially a problem. It is offering the image pck-up equipment with which this invention was made in view of such a situation, and the good picture image of the contrast which does not have a smear etc. even when the technical probrem's picturizes the upper part, preventing the picture image of the field containing a part for the road department becoming dark is acquired, and the good passage picture image and lane picture image of contrast are always acquired.

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MEANS

[Means for Solving the Problem] The image pck-up equipment which relates to invention according to claim 1 in order to solve the above-mentioned technical probrem The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, An image pck-up control signal generation means to generate the synchronizing signal which makes the image pck-up by the camera start, and to output to the above-mentioned camera for every fixed time, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included based on the picture signal obtained at the time of the odd image pck-up, Based on the picture signal obtained at the time of the odd image pck-up, the exposure time used at the time of the even image pck-up performed to the degree of the odd image pck-up is computed according to the brightness of the whole field other than the empty field detected by the empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to a camera, All the amount variant parts of transmitted lights in the field corresponding to the empty field detected among two or more amount variant parts of transmitted lights It shall have a VCF drive means to drive before the even image pck-up start performed to the degree of the odd image pck-up, and it shall be constituted so that the picture signal obtained, respectively at the time of the even image pck-up can be read from the exterior.

[0008] Moreover, the image pck-up equipment which relates to invention according to claim 2 in order to solve the above-mentioned technical probrem The camera which has the image sensors which output the picture signal according to the optical intensity of an incident light, and can control the exposure time of the incident light to image sensors, A VCF means to attenuate the quantity of light of the transmitted light if it has two or more amount variant parts of transmitted lights which have been arranged at the front-face side of image sensors and in which a split drive is possible and each amount variant part of transmitted lights drives, The frame signal which shows a clock generation means to output the clock signal used as criteria of operation, the synchronizing signal which makes the image pck-up by the camera start, the odd time, and the even image pck-up, respectively is generated from a clock signal. An image pck-up control signal generation means to output, and an A/D-conversion means to change a picture signal into image data, A sort means to classify image data into the 1st image data obtained at the time of the odd image pck-up, and the 2nd image data obtained at the time of the even image pck-up based on a frame signal, So that the 1st and 2nd storage meanses to memorize the 1st and 2nd image data, respectively, and the 1st storage means may memorize the 1st image data and the 2nd storage means may memorize the 2nd image data, respectively A storage-control means to control both the storage means based on a synchronizing signal and a frame signal, An empty field detection means to detect the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain is included from the 1st image data memorized by the 1st storage means, From the 1st image data memorized by the 1st storage means, the exposure time used at the time of the even image pck-up performed to the degree of the odd image pck-up is computed according to the brightness of the whole field other than the empty field detected by the empty field detection means. An exposure-time calculation means to output the control signal showing this exposure time to a camera, Based on a frame signal and the detection result of an empty field detection means, all the amount variant parts of transmitted lights in the field corresponding to the empty field detected among two or more amount variant parts of transmitted lights It shall have a VCF drive means to drive before the even image pck-up start performed to the degree of the odd image pck-up, and it shall be constituted so that the 2nd image data memorized by the 2nd storage means can be read from the exterior.

[0009] Preferably, an exposure-time calculation means computes the exposure time used at the time of the odd image pck-up performed in a time one after another according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up, and it is constituted so that the control signal showing

this exposure time may be outputted to a camera. Preferably, two or more amount variant parts of transmitted lights are arranged at least at vertical 1 train so that the whole abbreviation of the front face of image sensors may be covered. It is a position corresponding to the center of each desirable longitudinal direction of the amount variant part of transmitted lights of a plurality [means / empty field detection]. After detecting a brightness change lengthwise [in the odd image pck-up domain] and performing smoothing to this detected brightness change data Calculate the absolute value of the rate of change of the smoothed brightness change data, and a parvus predetermined value is made into a threshold from the maximum of the calculated absolute value. And the position which exceeds a threshold from the head of brightness change data is searched, and it judges that the position which exceeded the threshold first is the boundary of the empty field in the odd image pck-up domain, and fields other than an empty field, and it is constituted so that the field above this boundary may be detected as an empty field. Preferably, the VCF means consists of liquid crystal equipment. Preferably, thresholds are one half of values of maximum.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

OPERATION

[Function] With image pck-up equipment according to claim 1, a camera starts an image pck-up of each time by the input of a synchronizing signal. At the time of the odd image pck-up (2n - the 1st time), while the empty field in an image pck-up domain is detected by the empty field detection means, it is computed by the exposure-time calculation means according to the brightness of the whole field other than the empty field where the exposure time used at the time of the even image pck-up (2ntime) was detected. All the amount variant parts of transmitted lights that are in the field corresponding to the empty field detected at the time of the odd image pck-up among two or more amount variant parts of transmitted lights of a VCF means before the even image pck-up (2ntime) are driving by the VCF drive means so that the quantity of light of an empty field may be attenuated. Therefore, at the time of the even image pck-up (2ntime), an image pck-up is made by the exposure time which is in the status decreased by the amount variant part of transmitted lights which has the quantity of light of an empty field in the field corresponding to an empty field, and was computed by the exposure-time calculation means. And the external ** output of the picture signal obtained, respectively at the time of the even image pck-up can be carried out.

[0011] Moreover, with image pck-up equipment according to claim 2, a camera starts an image pck-up of each time by the input of a synchronizing signal. After changing into image data the picture signal obtained at the time of an image pck-up of each time by the A/D-conversion means, it is classified into the 1st image data obtained based on a frame signal at the time of the odd image pck-up, and the 2nd image data obtained at the time of the even image pck-up according to a sort means. By the control by the storage-control means, the 1st image data is memorized by the 1st storage means, and the 2nd image data is memorized by the 2nd storage means, respectively. At the time of the odd image pck-up (2n - the 1st time), from the 1st memorized image data, while the empty field in an image pck-up domain is detected by the empty field detection means, it is computed by the exposure-time calculation means according to the brightness of the whole field other than the empty field where the exposure time used at the time of the even image pck-up (2ntime) was detected. Before the even image pck-up (2ntime), all the amount variant parts of transmitted lights in the field corresponding to the empty field detected at the time of the odd image pck-up among two or more amount variant parts of transmitted lights of a VCF means have already driven by the VCF drive means. Therefore, at the time of the even image pck-up (2ntime), an image pck-up is made by the exposure time which is in the status decreased by the amount variant part of transmitted lights which has the quantity of light of an empty field in the field corresponding to an empty field, and was computed by the exposure-time calculation means. And the 2nd image data memorized by the 2nd storage means can be outputted to the exterior.

[0012] Thus, since it is made where the quantity of light of the empty field detected with image pck-up equipment according to claim 1 at the time of the odd image pck-up to which the even image pck-up is performed before the image pck-up is decreased by the VCF means Even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the quantity of light by the VCF means according to the change can be changed in the vertical orientation. Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. And since the picture signal used for controlling a VCF means differs from the picture signal to output, when the sun is picturized by vibration of a vehicle etc., the picture image with a smear [that the quantity of light is allowed to decline by the VCF means] or a blooming is not outputted for a moment, either.

[0013] Moreover, since the 1st image data used for detecting an empty field at the time of the odd image pck-up, and computing the exposure time with image pck-up equipment according to claim 2 and the 2nd image data used for outputting to the equipment exterior at the time of the even image pck-up are memorized for another storage means, it can prevent more that the picture image with a smear or a blooming is outputted

to an authenticity. Moreover, the each odd image pck-up is made by the exposure time according to the dawn lightness of an image pck-up domain which changes every moment by computing the exposure time used one after another at the time of an image pck-up of a time according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up. Moreover, the quantity of light of the arbitrary fields of image sensors can be decreased by the amount variant part of transmitted lights by arranging in vertical 1 train at least so that two or more amount variant parts of transmitted lights may be covered for the whole abbreviation of the front face of image sensors. Moreover, in case the boundary of an empty field is detected, by performing smoothing to the detected brightness change data, a very small brightness change included in brightness change data can be removed, and the boundary detection with little influence by the noise can be performed. Moreover, a VCF means is realizable by the device of marketing of liquid crystal equipment, then a VCF means. Moreover, the time at the time of searching the position which exceeds a threshold from the head of brightness change data can be shortened by having set the threshold to one half of maximums.

[0014]

[Embodiments of the Invention] Hereafter, the gestalt of implementation of this invention is explained based on a drawing. Drawing 1 shows the image pck-up equipment concerning the 1 operation gestalt of this invention. This image pck-up equipment is carried in vehicles, such as an automobile, and it is used for acquiring the passage picture image and lane picture image for detecting a front run way for example. The image pck-up equipment shown in drawing 1 is equipped with CCD camera (only henceforth a camera) 1. This camera 1 is equipped with LCD (liquid crystal equipment)4 arranged at the front-face (light-receiving side) side of CCD3 and CCD3 which outputs the picture signal according to the optical intensity of the light which carries out incidence through a lens 2 and the lens 2, and is constituted possible [a control of the exposure time of the incident light to CCD3].

[0015] The camera 1 is installed in the predetermined part of an automobile 5, for example, the up inside of windshield 5a, so that a lens 2 side turns to the front, and a camera optical axis (optical axis of a lens 2) may receive horizontally and may make a predetermined angle (refer to the drawing 6). CCD3 is 2-dimensional CCD which has the pixel of the masses arranged in 2 dimensions, reads the output which changed the optical intensity of an incident light into the electrical signal by the photoelectrical transducer of each pixel one by one, and outputs it as a picture signal.

[0016] LCD4 has two or more blocks (the amount variant part of transmitted lights) which have been arranged at the front-face side of CCD3 and in which a split drive is possible. That is, LCD4 is divided into nxm piece block 4a as shown in drawing 2 , and each block 4a consists of a polarizing plate of a liquid crystal cell and a couple etc. Since each block 4a is independently driven by controlling the voltage given to each block 4a and the permeability changes, only the quantity of light of the light which penetrates the field of each driven block 4a, and carries out incidence to CCD3 can be attenuated. Therefore, the quantity of light of the arbitrary fields of image pck-up within the limits picturized with a camera 1 can be attenuated by driving block 4a in the arbitrary fields of two or more block 4a.

[0017] The image pck-up equipment shown in drawing 1 is equipped with the clock generation circuit 6 which outputs the clock signal used as the criteria of operation other than a camera 1, the image pck-up control signal generation circuit 7, A/D converter 8, the change circuit 9, the 1st store circuit 10, the 2nd store circuit 11, the storage-control circuit 12, the empty field detector 13, the exposure-time calculation circuit 14, and LCD drive circuit 15. The image pck-up control signal generation circuit 7 generates and outputs the synchronizing signal S1 which makes the image pck-up by the camera 1 start, and the frame signal S2 which shows the odd image pck-up and the even image pck-up, respectively from the clock signal outputted from the clock generation circuit 6. A synchronizing signal S1 is a pulse signal outputted for every fixed time. On the other hand, the frame signal S2 is set to "0" at the time of the odd image pck-up, and is set to "1" at the time of the even image pck-up.

[0018] A/D converter 8 changes into the image data of a digital signal the picture signal outputted from CCD3. The change circuit 9 is the odd time (2n - the 1st time.) about the image data outputted from A/D converter 8 based on the frame signal S2 outputted from the image pck-up control signal generation circuit 7. Here, n is distributed to the image data at the time of an image pck-up of one or more integers (the 1st image data), and the image data (the 2nd image data) at the time of the even image pck-up (2ntime). The storage-control circuit 12 is constituted so that both the store circuits 10 and 11 may be controlled by the storage-control signal generated from the signal showing a clock signal, the synchronizing signal S1, the frame signal S2, and the exposure time mentioned later so that the image data at the time of the image pck-up whose 2nd store circuit 11 is the even time about the image data at the time of the image pck-up whose 1st store circuit 10 is the odd time may be memorized to timely, respectively.

[0019] The empty field detector 13 detects the empty field where the whole abbreviation of the empty fraction in the odd image pck-up domain (image pck-up screen) is included, and it consists of the 1st image data memorized by the 1st store circuit 10 so that the signal showing this detected empty field may be

outputted. The exposure-time calculation means 14 from the 1st image data memorized by the 1st storage means 10 The exposure time (T2n) used according to the mean brightness of the whole field other than the empty field detected by the empty field detection means 13 in the odd image pck-up domain (2n - the 1st time) at the time of next time (2ntime), i.e., the even image pck-up, is computed. It is constituted so that the signal showing this exposure time may be outputted to a camera 1 at the time of the even image pck-up. Moreover, the exposure-time calculation means 14 computes a time (T2n+1), i.e., the exposure time at the time of the odd image pck-up (2n+1 time), one after another according to the mean brightness of the whole image pck-up domain at the time of the odd image pck-up (2n - the 1st time), and it is constituted so that the signal showing this exposure time may be outputted to a camera 1 one after another at the time of an image pck-up of a time. Furthermore, the exposure-time calculation means 14 outputs the signal with which the exposure time of the midrange value which can be set up as exposure time is expressed at the time of the 1st image pck-up after activation of image pck-up equipment to a camera 1. In addition, it may memorize in the memory whose computed exposure time (2n, 2n+1) is not illustrated, and you may constitute so that each of this memorized exposure time may be used at the time of a corresponding image pck-up.

[0020] LCD drive means 15 drives all block 4a in the field corresponding to the empty field detected by the empty field detection means 13 among two or more block 4a of LCD4 at the time of the odd photography (2n - the 1st time) so that permeability may be fallen before the even image pck-up start (2ntime). Since it drives independently by LCD drive means 15 and the permeability falls, each block 4a can attenuate only the quantity of light of the light which penetrates each block 4a and carries out incidence to CCD3.

[0021] If a synchronizing signal S1 is outputted from the image pck-up control signal generation means 7, the camera 1 is constituted so that exposure may be started. That is, a camera 1 will reset the charge accumulated at the charge store section of each pixel of CCD3, if a synchronizing signal S1 is inputted. The charge store section of each pixel of CCD3 begins to accumulate the charge according to the optical intensity of an incident light, exposure is started by this, and an image pck-up of each time is started. Moreover, when the amount (average) of charges accumulated among the charge store section of each pixel of CCD3 at the time of an image pck-up of each time turns into the amount of charges corresponding to the exposure time which the signal outputted from the exposure-time calculation means 14 expresses, the camera 1 is constituted so that read-out of an output may be started from the charge read-out section of each pixel of CCD3. Thus, a camera 1 is controlled by the signal with which the synchronizing signal S1 and the exposure time are expressed for the exposure time after resetting the charge accumulated among the charge store section of each pixel of CCD3 at the time of an image pck-up of each time until it starts read-out of the output of each pixel of CCD3. In addition, it is asked for the relation with the amount of charges corresponding to the exposure time and the exposure time by experiment. Furthermore, the image pck-up equipment shown in drawing 1 is constituted so that the 2nd image data memorized by 2nd storage means 11 (2ntime), i.e., the even image data, may be considered as an equipment output and it can read from the exterior.

[0022] Next, the operation of image pck-up equipment which has the above-mentioned configuration is explained based on drawing 3 . Drawing 3 shows flowing of an operation of image pck-up equipment together with the synchronizing signal S1 and the frame signal S2. In this drawing, the quadrature axis shows the passage of time.

[0023] (1) Explain the operation common to an image pck-up of each time first. A camera 1 resets the charge accumulated by the input of a synchronizing signal S1 at the charge store section of each pixel of CCD3. Exposure is started by this and an image pck-up of each time is started. After image pck-up start, a camera 1 reads an output (picture signal) from the charge read-out section of each pixel of CCD3, when the amount of charges accumulated at the charge store section of each pixel of CCD3 turns into the amount of charges corresponding to the exposure time which the output signal of the exposure-time calculation means 14 expresses. Exposure is completed by this. After the picture signal outputted from CCD3 is changed into image data by A/D converter 8, it is classified into the 1st image data obtained based on the frame signal S2 at the time of the odd image pck-up (2n - the 1st time), and the 2nd image data obtained at the time of the even image pck-up (2ntime) according to the sort means 9. And by the control by the storage-control means, the 1st image data is memorized by the 1st storage means 10, and the 2nd image data is memorized by the 2nd storage means 11, respectively.

[0024] (2) Next, explain the odd image pck-up (2n - the 1st time). Now, the image pck-up to the even time (2n - the 2nd time) shall be completed. At this time, all block 4a of LCD4 is in the transparency status (whole LCD surface transparency). If a synchronizing signal S1 is inputted into a camera 1 at t 1:00 of drawing 3 , exposure will be started and an image pck-up will be started. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time which the output signal of the exposure-time calculation means 14 expresses, an output (picture signal) is read from each pixel of CCD3, and exposure is completed. The picture signal obtained at this time is changed into image data, and is memorized by the 1st storage means 10.

[0025] Next, the empty field in an image pck-up domain is detected by the empty field detection means 13 from the 1st image data memorized by the 1st storage means 10. According to the brightness of the whole field other than the empty field where the exposure time (T2n) used at the time of the even image pck-up (2ntime) was detected, it is computed by the exposure-time calculation means 14 after this detection. At this time, the exposure time (T2n+1) used at the time of the odd image pck-up (2n+1 time) performed in a time one after another is also computed by the exposure-time calculation means 14 according to the mean brightness of the whole image pck-up domain containing fields other than the detected empty field and an empty field. All block 4a in the field corresponding to the empty field detected among two or more block 4a of LCD4 before the even image pck-up start (2ntime) performed to a degree being simultaneous or at least with this calculation is driven by LCD drive means 15 so that the quantity of light may be decreased with each block.
[0026] (3) Next, explain the even image pck-up (2ntime). If a synchronizing signal S1 is inputted into a camera 1 at t 2:00 of drawing 3 , exposure will be started and an image pck-up will be started. At the time of this image pck-up, since all block 4a in the field corresponding to the empty field detected among two or more block 4a of LCD4 at the time of the odd image pck-up (2n - the 1st time) has already driven by LCD drive means 15, an image pck-up is made in the status that it decreased by all block 4a that has the quantity of light of an empty field in the field corresponding to this field. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time (T2n) computed with the exposure-time calculation means 14, an output is read from each pixel of CCD3, and exposure is completed. The picture signal obtained at this time is changed into image data, and is memorized by the 2nd storage means 10. This 2nd memorized image data is read to the exterior. After storage of the 2nd image data, a drive of LCD4 by LCD drive means 15 is canceled, and all block 4a of LCD4 is changed into the transparency status (whole LCD surface transparency).
[0027] (4) Next, explain the odd image pck-up (2n+1 time). If a synchronizing signal S1 is inputted into a camera 1 at t 3:00 of drawing 3 , exposure will be started and an image pck-up will be started. After image pck-up start, when the amount of charges accumulated at each pixel of CCD3 turns into the amount of charges corresponding to the exposure time (T2n+1) computed with the exposure-time calculation means 14, an output is read from each pixel of CCD3, and exposure is completed. Since it is the same as that of the time of the odd image pck-up (2n - the 1st time) mentioned above, a next operation is omitted.
[0028] Thus, the odd image pck-up and the even image pck-up are repeated by turns at the time of a run. In addition, at the time of activation of image pck-up equipment, all block 4a of LCD4 is in the transparency status (complete transparency). Moreover, at the time of the 1st image pck-up, the exposure-time calculation means 14 outputs the signal showing the midrange value which can be set up as exposure time.
[0029] Next, detection processing of the empty field which the empty field detection means 13 performs is explained based on the drawing 4 and the drawing 5 . A detection of an empty field is performed using the 1st image data memorized by the 1st storage means 10 by processing the brightness value of the orientation of Y in the position corresponding to the center of the orientation of X of each block 4a of LCD4. As an explanation here of operation, LCD4 explains the case of processing about the picture image acquired when it shall be trichotomized by longitudinal direction (n= 3), and 8 splits (m= 8) shall be carried out to lengthwise and a vehicle puts in the entrance of a slope, in order to simplify an explanation.
[0030] X1, X2, and X3 of (A) show the center of the orientation of X of each block 4a in the left column of the three columns of LCD4 trichotomized by longitudinal direction, the center of the orientation of X of each block 4a in a central column, and the center of the orientation of X of each block 4a in a right-hand side column, respectively. [of drawing 4] The Y coordinate of the picture image shown in (A) of drawing 4 shall be expressed with Y= 0 - Ymax.
[0031] First, brightness change of the orientation of Y in the position of X1 of the picture image shown in (A) of drawing 4 is detected. This brightness change is shown by (A) of drawing 5 . The variation is the parvus, although an empty field has a large brightness value and there is a minute change, as shown in this drawing. In the fraction which shifts to fields other than the empty field which contains a mountain range, a building, a passage, etc. from an empty field, a brightness value becomes small abruptly, and a brightness value change is large.
[0032] Next, smoothing is performed to the brightness change data shown by (A) of drawing 5 , and a minute change is removed. Moving-average processing shown by the following formula 1 in order to perform this smoothing is used.
D(i+c/2) =(Di+Di+1+--+Di+c)/(c+1) (formula 1)
However, Di The number of the brightness value of Y=i, i= 0 - Ymax-c, and c is even. Although the value of c changes with field angles, it is usually made into several percent of Ymax. The smoothed brightness change data are shown by (B) of drawing 5 .
[0033] Next, the absolute value of the rate of change of the brightness change data smoothed by moving-average processing is calculated by the following formula 2. This result of an operation is shown by (C) of

drawing 5 .
Di =|Di+1-Di | (formula 2) However, they are i=c/2 - Ymax+1-c. The wave shown by (C) of drawing 5 shows a big value in the fraction with a rapid brightness change. Next, the maximum of the absolute value calculated by the formula 2 is calculated, one half of these maximums is made into a threshold, the position which exceeds the threshold from the head of the wave shown by (C) of drawing 5 is searched, and it judges that the position (Y coordinate) which exceeded the threshold first is the boundary of the empty field in the odd image pck-up domain, and fields other than an empty field.
[0034] Next, based on the position (Y coordinate) of the boundary for which it asked, lengthwise number k of block 4a of LCD4 driven by LCD drive means 15 is computed by the following formula (3). Since the field above the position of the boundary for which it asked is an empty field at this time, number k lengthwise [above-mentioned] is computed so that the quantity of light of the whole field corresponding to this empty field may be attenuated by LCD4 and the decrement field of the quantity of light by LCD4 may wrap in an empty field.
Integer part +1 of 1 <=k<=(Ys xm)/(Ymax+1) (formula 3)
However, Ys is the Y coordinate of the boundary of fields other than an empty field and an empty field, and m is the lengthwise number of partitions (here m= 8) of LCD4.
[0035] Such detection processing is performed about each position of X1, X2, and X3 of the picture image shown in (A) of drawing 4 . Consequently, the value of the right-hand side of a formula 3 becomes 4 in the position of 4 and X2 in the position of X1 in the position of 5 and X3. In the above-mentioned example of processing as a result of performing such detection processing, the position data of 4 are outputted to LCD drive means 15 from the empty field detection means 13 in the position of 4 and X2 in the position of X1 in the position of 5 and X3. As this shows to (B) of drawing 4 , the quantity of light of the whole field corresponding to an empty field declines by LCD4.
[0036] by the way, angle theta [as opposed to / when a vehicle passes the salient object of a passage etc., the car body vibrates greatly, and / the horizontal direction of the optical axis of a camera 1] -- initial angle theta 0 **** -- it fluctuates (refer to [the drawing 6 and] the drawing 7) In the meantime, the odd picturized picture image changes, as (A) - (E) of drawing 8 shows. For the picture image of (A) of this drawing, angle theta is the initial angle theta 0. Abbreviation etc. is carried out and is. the thing at the time, and the picture image of (B) Angle theta is the initial angle theta 0. The thing when becoming large, and the picture image of (C) Angle theta is the initial angle theta 0 again. For the thing at the time of ********s, such as abbreviation, and the picture image of (D), angle theta is the initial angle theta 0. For the thing when becoming small, and the picture image of (E), angle theta is the initial angle theta 0 again. The thing when becoming which spreads abbreviation etc. is shown, respectively.
[0037] In drawing 9 , 9A-9E correspond to the image pck-up screen which shows the start stage of the odd image pck-up, respectively, and is shown by (A) - (E) of drawing 8 , respectively. Moreover, 10A-10E show the start stage of the even image pck-up, respectively. 11A-11E are the picture images of image pck-up within the limits obtained at the time of the even image pck-up, and show a mode that the quantity of light of the field corresponding to an empty field is declining by LCD4 (filtered), respectively.
[0038] the odd time and the even image pck-up operation mentioned above when the picture image picturized by vibration of a vehicle etc. at the time of a vehicle run changed, as (A) - (E) of drawing 8 shows -- winding -- ****** -- the quantity of light of the field corresponding to the empty field is attenuated by LCD4, following the empty field which changes in the vertical orientation every moment by things, as shown in drawing 9 Even if the empty field of the picture image picturized at the time of a vehicle run changes with this in the vertical orientation, the field which attenuates the quantity of light by LCD4 according to the change can be changed.
[0039] As explained above, according to the image pck-up equipment concerning the above-mentioned operation gestalt, following effect (1) - (3) is obtained.
(1) Since it is made where the quantity of light of the empty field detected at the time of the odd image pck-up the even image pck-up is performed [an image pck-up] to the last time of the image pck-up is decreased by LCD4, even if the empty field of the picture image picturized at the time of a vehicle run changes in the vertical orientation, the field which attenuates the quantity of light by LCD4 according to the change can be changed. Therefore, even when the upper part is picturized by vibration of a vehicle etc., the good picture image of the contrast without a smear or a blooming is acquired.
(2) Moreover, since it is computed according to the brightness of the whole field other than an empty field at the time of the odd image pck-up (i.e., since the exposure time used for the even image pck-up is computed except for the empty field where brightness is high), the field containing a part for fields other than an empty field, i.e., the road department, is picturized with sufficient contrast, and it serves as a luminosity always proper. Therefore, it can prevent that the field containing a part for fields other than an empty field, i.e., the road department, becomes dark.
(3) The picture signal further used for controlling LCD4 differs from the picture signal outputted to the

exterior. Therefore, when the sun is picturized by vibration of a vehicle etc., the picture image with the smear which the quantity of light does not decrease by LCD4, or a blooming is not outputted for a moment, either. Therefore, the good passage picture image and lane picture image of contrast can always be acquired.
[0040] Thus, it is especially effective, when detecting a run way which is shown also in drawing 9 by the image processing indicated by JP,3-314775,A etc. using this image data using the edge information on the white line of a road surface, since the good passage picture image and lane picture image of contrast can always be acquired. In addition, as a modification of the image pck-up equipment concerning the above-mentioned operation gestalt, it may replace with LCD4 and other elements which have two or more blocks which can decrease the quantity of light and in which a split drive is possible, for example, an erection potter's wheel ****** element etc., may be used.
[0041] Moreover, although LCD4 should be trichotomized by longitudinal direction and 8 ****s should be made lengthwise in the above-mentioned explanation, what is necessary is just LCD currently divided into the plurality in vertical 1 train at least. Moreover, with the above-mentioned operation gestalt, by detection processing of an empty field, the maximum of the absolute value calculated by the formula 2 is calculated, and one half of these maximums is made into the threshold. Although this threshold should be just smaller than maximum, the time at the time of searching the position which exceeds a threshold from the head of brightness change data can be shortened by having set the threshold to one half of maximums. Moreover, as a modification of the image pck-up equipment concerning the above-mentioned 1 operation gestalt, it can replace with CCD3 and other image sensors can be used. Moreover, you may establish the shutter means for controlling the exposure time to a camera 1 as a modification of the image pck-up equipment concerning the above-mentioned 1 operation gestalt. A shutter means can change an incident light to CCD3 between the open status whose incidence is made possible, and the closed status made into the incidence impotentia, and a mechanical shutter, the optical element which can be changed between the **** status and the shading status can be used for it. Moreover, the image pck-up equipment concerning this invention can be used effective also not only in vehicles, such as an automobile, but vessels, such as a large motorboat of other vehicles, for example, swinging under run.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the whole image pck-up equipment configuration concerning the 1 operation gestalt of this invention.
[Drawing 2] It is the plan showing LCD.
[Drawing 3] It is explanatory drawing of the image pck-up equipment concerning the 1 operation gestalt of operation.
[Drawing 4] It is drawing for explaining detection processing of an empty field, and is explanatory drawing showing the picturized picture image.
[Drawing 5] It is explanatory drawing of signal processing for a detection of an empty field.
[Drawing 6] It is explanatory drawing of a camera optical axis.
[Drawing 7] It is explanatory drawing showing change of the camera optical axis at the time of a vehicle run.

[Drawing 8] It is explanatory drawing showing an image pck-up picture image at the time of the odd times under vehicle run.
[Drawing 9] It is explanatory drawing of operation showing a mode that LCD is driven, following the empty field which changes every moment.
[Drawing 10] It is explanatory drawing of the conventional example.
[Drawing 11] It is drawing showing the picture image at the time of the camera optical-axis change in the conventional example.
[Description of Notations]
1 Camera
3 CCD (Image Sensors)
4 LCD (VCF Means)
4a Block (the amount variant part of transmitted lights)
6 Clock Generation Circuit (Clock Generation Means)
7 Image Pck-up Control Signal Generation Circuit (Image Pck-up Control Signal Generation Means)
8 A/D Converter (A/D-Conversion Means)
9 Change Circuit (Sort Means)
10 1st Store Circuit (1st Storage Means)
11 2nd Storage Means (2nd Storage Means)
12 Storage-Control Circuit (Storage-Control Means)
13 Empty Field Detector (Empty Field Detection Means)
14 Exposure-Time Calculation Circuit (Exposure-Time Calculation Means)
15 LCD Drive Circuit (VCF Drive Means)

[Translation done.]

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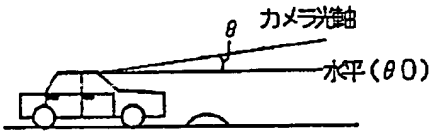
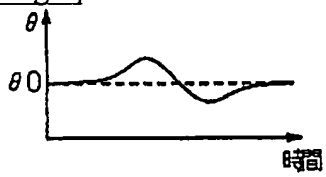
DRAWINGS

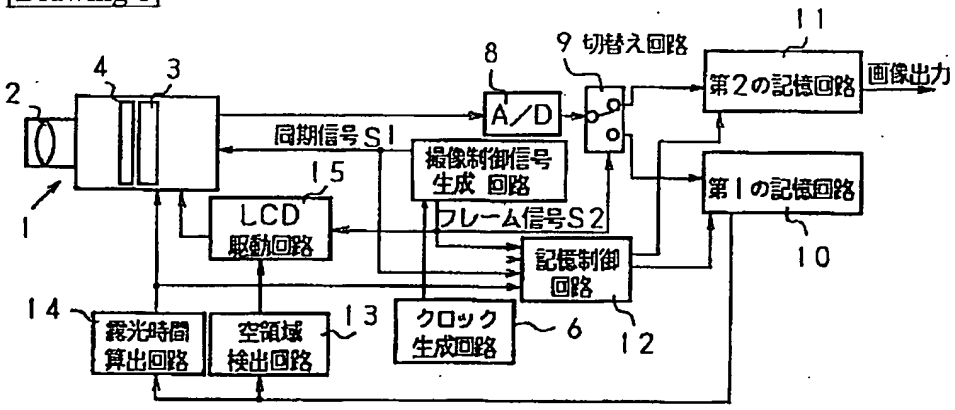
[Drawing 6]



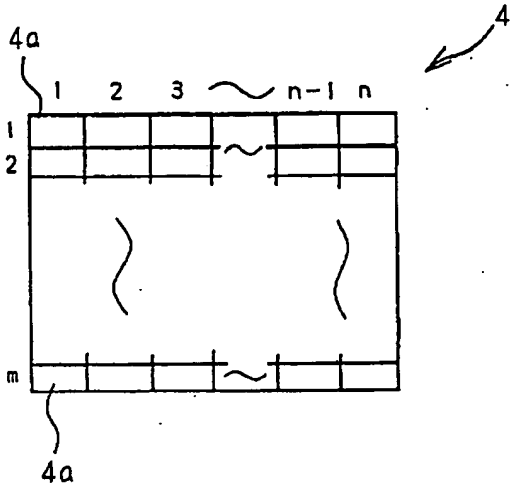
[Drawing 7]



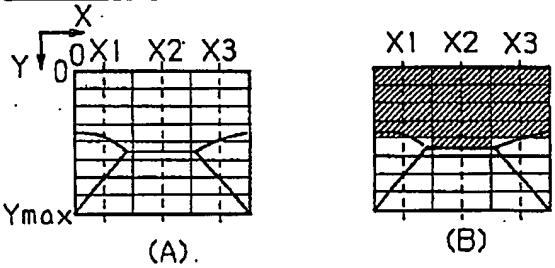
[Drawing 1]



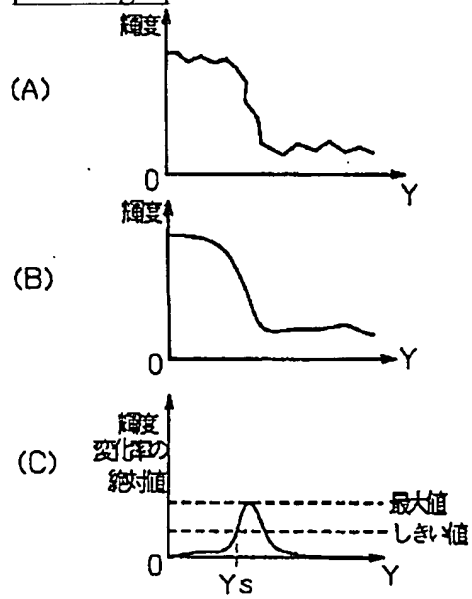
[Drawing 2]



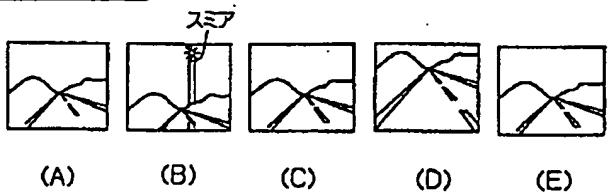
[Drawing 4]



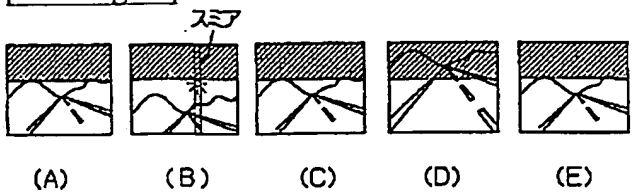
[Drawing 5]



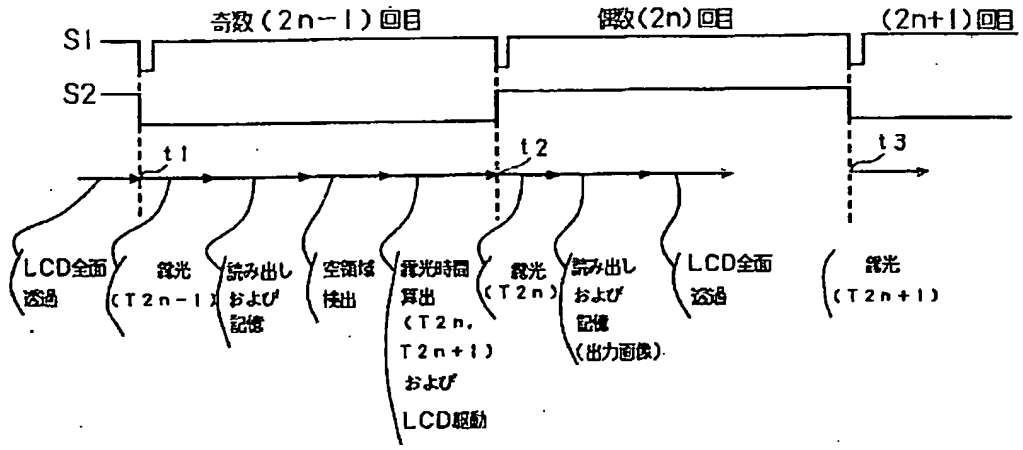
[Drawing 8]



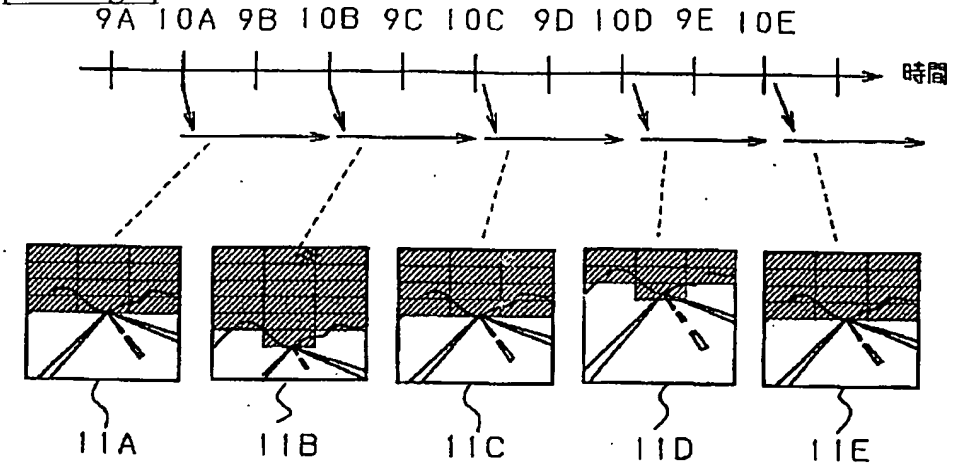
[Drawing 11]



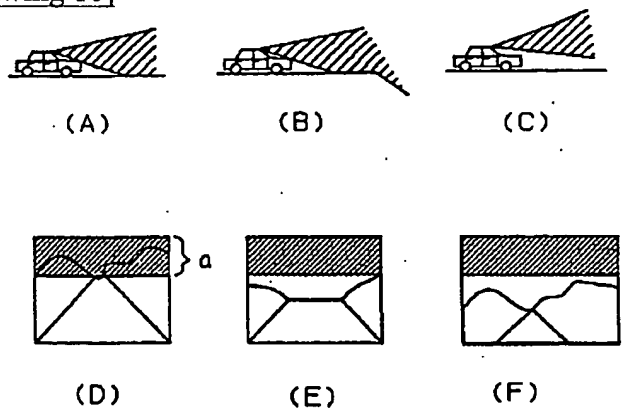
[Drawing 3]



[Drawing 9]



[Drawing 10]



[Translation done.]